

West Nile Virus Infection (Arboviral)

ONLY WNV INFECTIONS WITH CNS INVOLVEMENT ARE REPORTABLE

September 2004

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

There are about 570 viruses worldwide that are spread through arthropods (insects). More than 30 of these arboviruses have been identified as human pathogens in the Western Hemisphere. West Nile virus (WNV) is a member of the *Flaviviridae* family and *Flavivirus* genus, and only recently has appeared in the Northeast of the United States.

B. Clinical Description and Laboratory Diagnosis

WNV infection occurs as a mild illness including fever, headache, and body aches, often with a skin rash and swollen lymph glands. However, the vast majority of infections are asymptomatic. More severe infections involve the central nervous system and result in meningitis, encephalitis or acute flaccid paralysis. WNV encephalitis cannot be distinguished clinically from many other causes of encephalitis. Manifestations can include headache, confusion, lethargy, nausea, altered consciousness, vomiting, fever, cranial nerve palsies, paresis (muscular weakness) or paralysis, sensory deficits, altered reflexes, tremors, convulsions, abnormal movements, coma of varying degree, and, in some cases, death. Case-fatality ratios for WNV encephalitis range from 3% to 15%.

Laboratory diagnosis is based upon isolation of virus or identification of viral antigen or nucleic acids in clinical specimens, demonstration of antibodies in cerebrospinal fluid (CSF), and serum by enzyme immunoassay (EIA), hemagglutination inhibition (HI) and plaque-reduction neutralizing test (PRNT).

C. Reservoirs

WNV appears to be carried by birds. The virus persists in nature in a bird-mosquito cycle, involving mosquitoes which primarily feed on birds. In mid to late summer and early fall, amplification of the cycle may occur, with spillover of the virus into mosquitoes which bite humans, horses and other mammals. Humans, horses and other mammals are generally considered dead-end hosts, i.e., they do not serve as a reservoir for continuation of the disease.

D. Modes of Transmission

WNV is primarily spread to humans by the bite of an infected mosquito. Recent evidence supports the potential for WNV transmission from bird-to-bird, possibly through fecal-oral transmission. Direct person-to-person spread of arboviral encephalitis does not occur. There is no evidence that a person can get WNV from handling live or dead infected birds; gloves should always be worn when performing such activities. In 2002, three additional routes of WNV human infection were discovered, although these types of transmission occur in a very small proportion of WNV cases. These additional routes of transmission include:

- Transplanted organs and blood transfusions. Starting in 2003, all blood donations are screened for WNV and positive results are sent to the NJDHSS. The blood screening program has been very successful in reducing the risk of WNV infection through blood transfusions.
- Transplacental (mother-to-child) and breast milk transmission. Only one case of each has been identified, and both were outside of NJ.

- Transmission to laboratory workers through improperly handled specimens. Two cases were reported last year outside of NJ.

It is important to note that WNV transmission primarily occurs through the bite of an infected mosquito and these additional routes of transmission pose a relatively small risk.

E. Incubation Period

The incubation period for WNV is 5–15 days.

F. Period of Communicability or Infectious Period

WNV, as other arboviral infections, is not transmitted from person-to-person.

G. Epidemiology

WNV was first isolated in the West Nile Province of Uganda in 1937. The first epidemic was in Israel during the 1950s. WNV occurs naturally in Africa, India, Australia, the Middle East and Eastern Europe. Previous to August 1999, when human cases of WNV were identified in New York City, WNV had not been documented in the Western Hemisphere. By the end of October 1999, WNV had also been confirmed in multiple native species of birds from New York City and from areas within a 200-mile radius in horses and birds. As of August 2002, WNV has spread coast- to-coast in the United States and Canada. The elderly are at greatest risk of WNV encephalitis. In New Jersey, 34 confirmed cases of WNV infection were reported to NJDHSS in 2003, with 3 fatalities.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. The New Jersey Department of Health and Senior Services (NJDHSS) Case Definition

CASE CLASSIFICATION

A. CONFIRMED

A febrile illness associated with neurologic manifestations ranging from headache to aseptic meningitis or encephalitis, **AND**

- Isolation of WNV from, or demonstration of WN viral antigen or genomic sequences in tissue, blood, CSF, or other body fluid, **OR**
- Demonstration of IgM antibody to WNV in CSF by IgM-capture EIA, **OR**
- A greater than or equal to four-fold serial change in plaque-reduction neutralizing (PRNT) antibody titer to WNV in paired, appropriately timed serum or CSF samples, **OR**
- Demonstration of both WNV-specific IgM (by EIA) and IgG (screened by EIA or HI and confirmed by PRNT) antibody in a single serum specimen.

B. PROBABLE

Not used.

C. POSSIBLE

Not used.

NOTE: NJDHSS and CDC are the only agencies with the authority to confirm suspect cases of WNV. Positive WNV test result need to be confirmed at NJDHSS.

B. Laboratory Testing Services Available

The Public Health and Environmental Laboratories (PHEL) perform IgG and IgM EIA tests for WNV on human serum and cerebrospinal specimens. Accurate information about date of collection, date of onset of symptoms, travel history, flaviviruses vaccination and disease history are essential for test interpretation. All suspect cases must be approved by the NJDHSS Infectious and Zoonotic Disease Program (IZDP) prior to submission for testing at PHEL. Cases not approved for testing can be sent to a commercial laboratory; however positive results must be confirmed at PHEL.

For additional information on submitting samples or testing for other types of arboviral infection, contact NJDHSS IZDP at 609.588.7500 or 609.588.3121.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify locally acquired cases of WNV infection in humans to better understand the local epidemiology of WNV virus.
- To identify locally acquired cases of WNV infection in humans to help target mosquito control measures.
- To provide residents of New Jersey and travelers to the state with appropriate preventive health information.

B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (N.J.A.C. 8:57-1.8) stipulates that laboratories and health care providers must report all cases of WNV infection (by telephone, confidential fax, or in writing) to the local health officer having jurisdiction over the locality in which the patient lives, or, if unknown, to the health officer in whose jurisdiction the health care provider requesting the laboratory examination is located

C. Local Department of Health Responsibilities

1. Reporting Requirements

Local health officers must report the occurrence of any case of WNV infection, as defined by the reporting criteria in Section 2 A above. However, since most cases of WNV are identified by the NJDHSS PHEL, local health agencies will most likely be called by IZDP staff and notified of confirmed cases. Physicians may report positive WNV results from testing conducted by outside laboratories to local health departments. In these cases, confirmation is made by retesting at the PHEL; false positive results from outside laboratories are common.

2. Case Investigation

Case investigation of WNV infection in New Jersey residents will be directed by NJDHSS.

- a. The most important step a local health officer can take if he/she learns of any case of WNV infection is to call the NJDHSS IZDP within 24 hours of identification during regular business hours at 609.588.3121.
- b. Local health department staff may be asked to assist in identifying cases of WNV, or obtaining information and specimens to confirm cases of WNV. As such, local health department staff should be familiar with the following:
 1. Clinical specimens from suspect cases of WNV must be pre-approved by NJDHSS WNV staff before forwarding to PHEL for testing. Local health departments can facilitate the identification of suspect cases by distributing WNV diagnostic criteria to health care providers and laboratories within their jurisdiction. Diagnostic criteria and guidelines for testing can be found at <http://www.state.nj.us/health/cd/westnile/enceph.htm>.
 2. Local health department staff and / or health care providers should record WNV clinical, diagnostic and exposure information on the WNV Patient Intake Form [CDS-2](#) and immediately fax to the NJDHSS WNV staff at 609.588.2546 to obtain approval for testing. The following information must be on the CDS-2 form: case demographics, date of symptom onset, detailed clinical symptoms, diagnostic testing and results, patient status, contact information for the person reporting the suspect case AND the clinician who should receive test results, and detailed travel

history including location and dates of local outdoor activity that may have resulted in exposure to WNV. Failure to obtain any of this information may result in a delay in testing, identification of cases and environmental response.

3. Suspect cases that are not approved by NJDHSS WNV staff for testing at PHEL can be sent to hospital or commercial laboratories for WNV screening. WNV IgM reactive specimens must be confirmed at PHEL. Local health department staff may be asked to assist with case confirmation by completing a [CDS-2](#) form or forwarding IgM reactive specimens from commercial laboratories. Guidelines for forwarding specimens can be found <http://www.state.nj.us/health/cd/westnile/enceph.htm>.

Please note: Specimens that are reactive for WNV IgG only, and not IgM, are indicative of a previous infection and are not counted as an acute case of WNV. Local health departments and health care providers are not required to report cases that are only reactive for IgG.

- c. WNV clinical information, diagnostic testing and exposure history are recorded in the IZDP West Nile Virus ESRI database. Local health departments have read-only access to case information within their jurisdictions. Information from the CDS-2 form can only be recorded by NJDHSS WNV staff. As such, local health departments and / or health care providers are asked to report WNV-related information by phone and fax any requested information to the IZDP so that NJDHSS WNV staff can maintain timely information in the WNV ESRI database. At the end of the WNV season, NJDHSS WNV staff will upload confirmed cases from the WNV ESRI database to CDRS.
Please note: CDRS is not the primary reporting source for WNV and cases entered into CDRS may be deleted or transferred to the WNV ESRI database for further investigation. Local health department staff is advised to review WNV ESRI reports, not CDRS, for up-to-date information about WNV in their jurisdiction.
- d. Clinician or/and local health officers may be asked to assist with obtaining travel and outdoor exposure history for any case of the WNV. This information must be obtained as soon as possible to assist state and local agencies with response initiatives such as mosquito control to prevent any further cases in a given area.
- e. Institution of disease control measures is an integral part of case investigation. It is the local health officer's responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 5, "Controlling Further Spread."

4) AVIAN SURVEILLANCE

Crows continue to be good sentinels for detecting the presence of WNV activity in a general geographic area because of their susceptibility to the virus. NJDHSS requests the participation of local health officers, animal control officers, local police, and wildlife management professionals in the accurate reporting of crow morbidity and mortality incidents in New Jersey.

The following guidelines have been prepared to accurately monitor and report avian morbidity and mortality statewide.

Local Health Departments (LHDs) will be the lead agency in the coordination of the DEAD-ILL BIRD REPORT/LAB SUBMISSION form by faxing the form upon completion to NJDHSS IZDP at 609.588.2546.

DEAD-ILL BIRD REPORT/LAB SUBMISSION form: LHDs should receive reports of dead or ill birds from residents, animal control officers, and local police. **LHDs are responsible for informing animal control officers and local police of the proper submission and reporting protocol.** The [DEAD-ILL BIRD REPORT/LAB SUBMISSION form](#) must be completed in its entirety and faxed to NJDHSS at 609.588.2546. LHDs should ensure that the specific address of the dead or ill bird and county are included. Addresses are critical when mapping the exact location of positive birds.

SUBMISSION: Specimens must be submitted to PHEL within 4-5 days of collection, preferably less. All specimens should be kept refrigerated and shipped to PHEL the on cold gel packs or dry ice (i.e., not ice). LHDs should ensure that specimens arrive on or before Friday, as the PHEL is closed on weekends.

DO NOT FREEZE BIRDS. Birds showing signs of decay, decomposition, or infestation with maggots should **NOT** be submitted.

Laboratory personnel have requested that birds be submitted as follows:

- a. Place each bird into a separate one-gallon, clear, plastic bag with an “Easy Close Slider/Zipper.”
- b. Place the completed DEAD-ILL BIRD REPORT/LAB SUBMISSION form into a separate clear, plastic zip lock bag.
- c. Firmly secure the two (2) bags together with staples.

Do not submit samples in large green garbage bags. Samples that are not submitted according to this protocol or without proper paperwork will **NOT** be tested.

5) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements

None.

B. Protection of Contacts of a Case

For WNV encephalitis, there are no recommendations for protection of contacts of a case. There is no approved human vaccine available, and person-to-person transmission does not occur.

C. Managing Special Situations

Locally Acquired Case

If investigations reveal that a patient does not have recent travel history to an endemic area or country, environmental measures such as investigating local areas visited by the patient to locate the focus of infection and surveillance of other people for illness may be necessary. The local mosquito control agency should be notified of the case and the local travel history. The agency will conduct mosquito surveillance and abatement activities as indicated. See Section D, below.

Reported Incidence Is Higher than Usual/Outbreak Suspected

If an outbreak is suspected, contact the NJDHSS IZDP at 609.588.3121. The situation may warrant an investigation of clustered cases or implementation of effective prevention and control measures (*e.g.*, spraying for mosquitoes). The IZDP staff helps determine a course of action to prevent further cases and can perform surveillance for cases across jurisdictions and which would be difficult to identify at a local level.

D. Preventive Measures

Environmental Measures

The New Jersey Department of Environmental Protection’s Office of Mosquito Control Coordination provides funding for mosquito surveillance in numerous sites throughout the state for WNV, EEE, and other vector-

borne diseases. Many local mosquito control agencies also conduct this type of surveillance. Results of mosquito surveillance can be accessed on NJDHSS website at

<http://www.state.nj.us/health/cd/westnile/enceph.htm>

Decisions about the need for mosquito pesticide spraying are normally made by the county mosquito control agencies (based on mosquito habitat and density, surveillance for EEE or WNV virus in mosquitoes, numbers of cases in birds and other animals, and numbers of cases in humans).

Personal Preventive Measures/Education

People, particularly those living in or visiting high-risk areas, are encouraged to protect themselves from mosquito bites by the use of repellents and protective clothing. They should also stay indoors at dawn and dusk when mosquitoes are most active. Gloves should be worn whenever handling horses and birds that are sick with, or have died from, known or suspect arboviral infection. Screens should be in good repair to prevent mosquitoes from entering houses.

Prevention of West Nile encephalitis involves reducing mosquito breeding around the home through:

- Disposal of old cans, plastic buckets, ceramic pots, or other containers that may collect water.
- Disposal of old, discarded tires.
- Cleaning clogged gutters.
- Eliminating water collecting in pool or boat covers.
- Turning over plastic wading pools and wheelbarrows when not in use.
- Changing frequently water in birdbaths.
- Draining standing puddles, ditches, tree holes and tree stumps.

ADDITIONAL INFORMATION

A *West Nile Fact Sheet* can be obtained at the NJDHSS website at <http://www.state.nj.us/health.htm>. Click on the “Topics A to Z” link and scroll down to the subject WNV.

The following is the formal Centers for Disease Control and Prevention (CDC) surveillance case definition for arboviral encephalitis. It is provided for your information only and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2 A of this chapter. CDC case definitions are used by the state health department and CDC to maintain uniform standards for national reporting. For reporting a case to the NJDHSS, always use the criteria outlined in Section 2 A.

Clinical description

Arboviral infection may result in a febrile illness of variable severity associated with neurologic symptoms ranging from headache to aseptic meningitis or encephalitis. Arboviral encephalitis cannot be distinguished clinically from other central nervous system infections. Symptoms can include headache, confusion or other alteration in sensorium, nausea, and vomiting. Signs may include fever, meningismus, cranial nerve palsies, paresis or paralysis, sensory deficits, altered reflexes, convulsions, abnormal movements, and coma of varying degree.

Laboratory criteria for diagnosis

- Fourfold or greater change in serum antibody titer; or
- Isolation of virus from or demonstration of viral antigen or genomic sequences in tissue, blood, cerebrospinal fluid (CSF), or other body fluid; or
- Specific immunoglobulin M (IgM) antibody by enzyme immunoassay (EIA) antibody captured in CSF or serum. Serum IgM antibodies alone should be confirmed by demonstration of immunoglobulin G antibodies by another serologic assay (*e.g.*, neutralization or hemagglutination inhibition).

Case classification

Probable: a clinically compatible case occurring during a period when arbovirus transmission is likely, and with the following supportive serology: a stable (\leq twofold change) elevated antibody titer to an arbovirus (*e.g.*,

≥320 by hemagglutination inhibition, ≥128 by complement fixation, ≥256 by immunofluorescence, and ≥160 by neutralization, or ≥400 by enzyme immunoassay IgM).

Confirmed: a clinically compatible case that is laboratory confirmed.

Comment

The seasonality of arboviral transmission is variable and depends on the geographic location of exposure, the specific cycles of viral transmission, and local climatic conditions. Reporting should be etiology-specific (see below; the five encephalitides printed below in bold are nationally reportable to CDC):

- **St. Louis encephalitis**
- **West Nile encephalitis**
- **Western equine encephalitis**
- **Eastern equine encephalitis**
- **California encephalitis serogroup** (includes infections from the following viruses: LaCrosse, Jamestown Canyon, Snowshoe Hare, Trivittatus, Keystone, and California encephalitis viruses)
- Powassan encephalitis
- Other CNS infections transmitted by mosquitoes, ticks, or midges (*e.g.*, Venezuelan equine encephalitis and Cache Valley encephalitis)

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